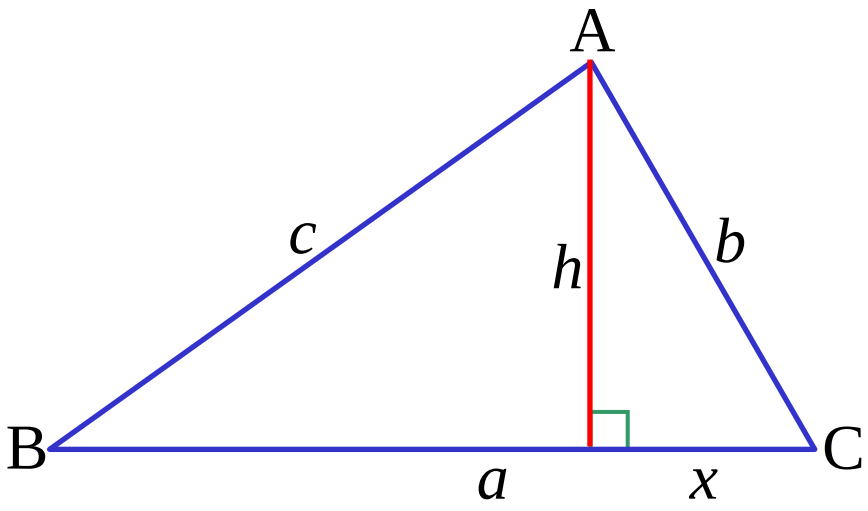
Cosine Rule



$$h^2 = b^2 - x^2$$

$$c^2 = h^2 + (a - x)^2$$

$$\therefore c^2 = b^2 - x^2 + a^2 - 2ax + x^2$$

$$= b^2 + a^2 - 2ax$$

$$\text{But } \frac{x}{b} = \cos C$$

$$x = b\cos C$$

$$\therefore c^2 = b^2 + a^2 - 2ab\cos C$$

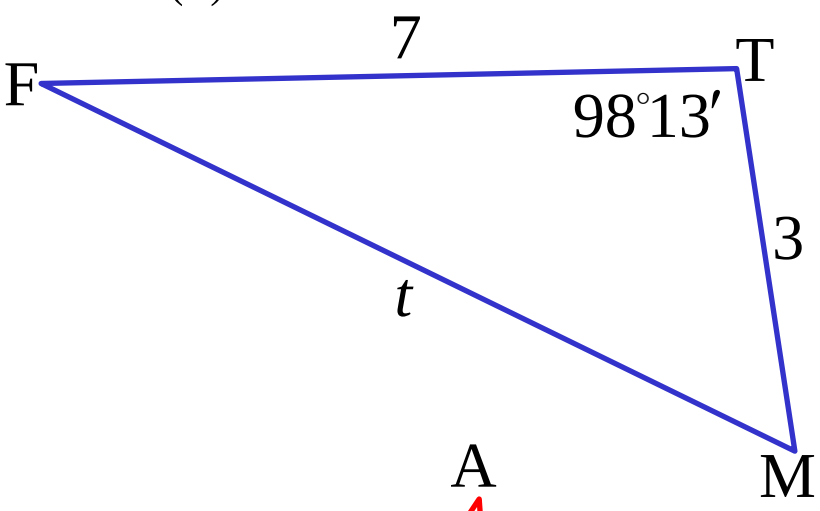
In any ΔABC

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$b^2 = a^2 + c^2 - 2ac\cos B$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

e.g. (i)

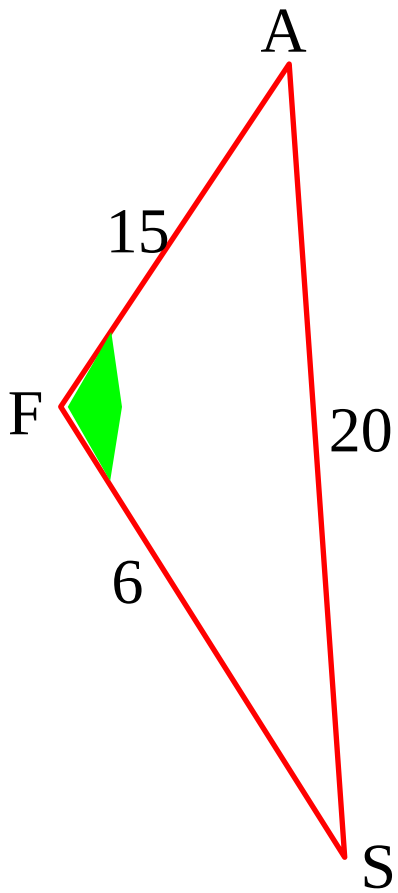


$$t^2 = f^2 + m^2 - 2fm\cos T$$

$$t^2 = 3^2 + 7^2 - 2(3)(7)\cos 98^\circ 13'$$

$t = 8$ units (to nearest whole number)

(ii)



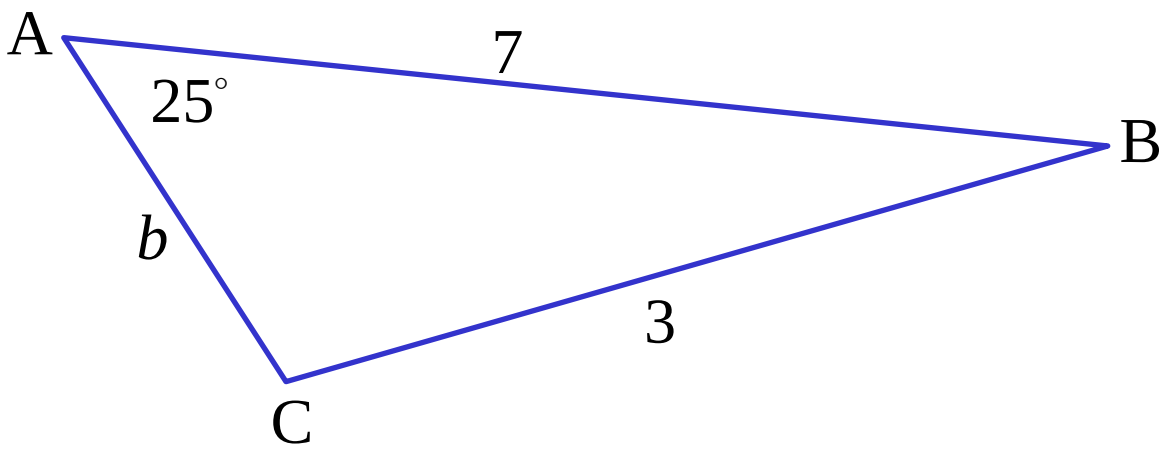
$$f^2 = a^2 + s^2 - 2as\cos F$$

$$\cos F = \frac{a^2 + s^2 - f^2}{2as}$$

$$\cos F = \frac{6^2 + 15^2 - 20^2}{2(6)(15)}$$

$F = 140^\circ 33'$

(iii)



$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$3^2 = b^2 + 7^2 - 2b(7)\cos 25^\circ$$

$$9 = b^2 + 49 - 14b\cos 25^\circ$$

$$b^2 - 14b\cos 25^\circ + 40 = 0$$

$$b = \frac{14\cos 25^\circ \pm \sqrt{196\cos^2 25^\circ - 160}}{2}$$

$b = 5.85$ units or $b = 6.85$ units (to 2 dp)

Exercise 4I; 1a, 2b, 4, 5, 7, 9, 11, 12, 13, 14*

Exercise 4J; evens